

**REMARKS**

Claims 1-5, 7-14 and 16-18 are pending. Claims 6 and 15 are cancelled and claims 1 and 10 are amended. A marked-up version showing the changes made by the present amendment is attached hereto as "**Version with markings to show changes made.**"

Claims 1, 3, 5-10, 12, 14-16 and 18 were rejected under 35 U.S.C. §102(b) as being anticipated by Imai et al. Favorable reconsideration is requested in view of the amendment made herein.

Imai et al. discloses growth of a first layer on a substrate at a growth rate of from 0.10 to 20 angstroms/sec with a substrate temperature of 300-1000° C. Subsequently, a second layer is grown at a growth rate of 0.10 to 10 angstroms/sec to form a nitride semiconductor device. Imai et al broadly discloses that a thickness of the first layer (the oriented polycrystalline nitride semiconductor layer) should preferably be within the range of from 10-5,000 angstroms.

Imai et al. describes forming a nitride semiconductor layer thinner than 5000Å at a growth rate from 0.1 to 20 Å/sec (the official action describes a film thickness of less than 500 angstroms, wherein 500 angstroms should read 5000 angstroms). Imai et al. merely describes a growth rate in a considerably broad range and a film thickness in a considerably broad range. Imai et al. describes the growth rates of 1.2 Å/sec, 1.3 Å/sec and 0.6 Å/sec in the embodiment which are much smaller than a growth rate of at least 7 Å/sec in the present invention. Although Comparative Example 5 of Imai et al. describes the growth rate of 150 Å/sec, the film thickness in Comparative Example 5 is 5000Å which is much larger than a film thickness in the range from 50 to 300Å in the present invention.

That is, although Imai et al. discloses forming a nitride semiconductor layer having a considerably large film thickness of 5000Å at a high growth rate, Imai et al. fails to disclose forming a nitride based semiconductor layer having a considerably small film thickness of "50 to

300Å” at a high growth rate of “at least 7Å/sec” to attain stably a high quality with good reproducibility.

Accordingly, Imai et al. fails to provide any teaching or suggestion of the claimed growth rate and thickness. More specifically, Imai et al. does not teach or suggest the particular claimed growth rate in combination with the claimed thickness. In this regard, it is noted that Imai et al. discloses that the thickness of the layer depends on the film growth rate (see col. 7, lines 6-8).

Claims 2, 4, 11 and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Imai et al. Favorable reconsideration of this rejection is earnestly solicited.

The Examiner argues that the choice of increasing the growth rate is well within the choice of one of ordinary skill in the art. However, Imai et al. clearly teaches away from growth rates greater than 20Å/sec. For example, see col. 12, lines 49-51. Accordingly, Imai et al. fails to teach or suggest the features of these claims.

Claim 17 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kondow et al. in combination with Imai et al. Favorable reconsideration of this rejection is earnestly solicited.

Kondow et al. is applied for its disclosure of a nitride-based semiconductor layer structure. Kondow, however, fails to provide the teachings which Imai et al. lacks, as discussed above. That is, the combination of references does not teach or suggest the claimed growth rate in combination with the claimed thickness.

For at least the foregoing reasons, the claimed invention distinguishes over the cited art and defines patentable subject matter. Favorable reconsideration is earnestly solicited.


Should the Examiner deem that any further action by Applicants would be desirable to place the application in condition for allowance, the Examiner is encouraged to telephone Applicants’ undersigned attorney.

U.S. Patent Application Serial No. 09/941,982

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, WESTERMAN & HATTORI, LLP

  
Stephen G. Adrian

Attorney for Applicant

Reg. No. 32,878

SGA/nrp

Atty. Docket No. 011083

Suite 1000, 1725 K Street, N.W.

Washington, D.C. 20006

(202) 659-2930



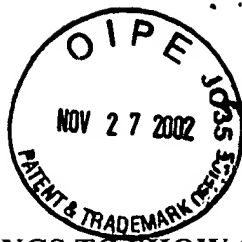
23850

~~202-822-1100~~

PATENT TRADEMARK OFFICE

Enclosures: Version with markings to show changes made  
Petition for Extension of Time

Q:\FLOATERS\SGA\01\011083 AMENDMENT



**VERSION WITH MARKINGS TO SHOW CHANGES MADE 09/941,982**

Please amend Claims 1 and 10, as follows:

1. (Amended) A method of forming a nitride-based semiconductor layer, comprising the steps of:

growing a buffer layer of  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 \leq x \leq 1$ ) on a substrate at a growth rate of at least  $7\text{\AA}/\text{sec}$ ; and

growing a nitride-based semiconductor layer of  $\text{Al}_a\text{B}_b\text{In}_c\text{Tl}_d\text{Ga}_{1-a-b-c-d}\text{N}$  ( $0 \leq a < 1$ ,  $0 \leq b < 1$ ,  $0 \leq c < 1$ ,  $0 \leq d < 1$ ,  $a+b+c+d < 1$ ) on said buffer layer, wherein

said step of growing the buffer layer comprises growing said buffer layer to have a film thickness in the range from  $50\text{\AA}$  to  $300\text{\AA}$ .

10. (Amended) A method of manufacturing a nitride-based semiconductor device, comprising the steps of:

growing a buffer layer of  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 \leq x \leq 1$ ) on a substrate at a growth rate of at least  $7\text{\AA}/\text{sec}$ ; and

growing a nitride-based semiconductor layer including an active device region on said buffer layer and made of  $\text{Al}_a\text{B}_b\text{In}_c\text{Tl}_d\text{Ga}_{1-a-b-c-d}\text{N}$  ( $0 \leq a < 1$ ,  $0 \leq b < 1$ ,  $0 \leq c < 1$ ,  $0 \leq d < 1$ ,  $a+b+c+d < 1$ ) on said buffer layer, wherein

said step of growing the buffer layer comprises growing said buffer layer to have a film thickness in the range from  $50\text{\AA}$  to  $300\text{\AA}$ .

RECEIVED  
DEC - 3 2002  
TECHNOLOGY CENTER 2800